REMARKS

Claim 1 has been amended, Claim 8 has been canceled and new claims 9-18 have been added. Thus, claims 1-7 and 9-18 are presented for examination. Support for new claims 9-18 may be found in the specification at page 23, paragraph [0048] and page 28, line 16. Since these amendments do not add new matter, entry thereof is respectfully requested. Reconsideration and withdrawal of the rejections in view of the amendments and comments presented herein are respectfully requested.

Obviousness-type double patenting rejection

Claims 1-8 were provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1 and 7-17 of copending Application No. 10/557,694 (US 2007/0065748). Enclosed herewith is a terminal disclaimer, thus overcoming this rejection.

Rejection under 35 U.S.C. §102(b)/103(a)

Claims 8 was rejected under 35 U.S.C. §102(b) as anticipated by, or in the alternative, under 35 U.S.C. §103(a) as obvious over, Nishimura et al. (US 2002/0132181). Since Claim 8 has been canceled, this rejection is moot.

Rejections under 35 U.S.C. §103(a)

Nishimura et al. (US 2002/0132181) in view of Padmanaban et al. (*Proceedings of SPIE*, 5039:743-751, 2003)

Claims 1-3 and 6-8 were rejected under 35 U.S.C. §103(a) as being unpatentable over Nishimura et al. (US 2002/0132181) in view of Padmanaban et al. (*Proceedings of SPIE*, 5039:743-751, 2003). The Examiner acknowledges that Nishimura et al. do not disclose that the acid generator (b) has the structure represented by the formula (b-1) or (b-2) as recited in claim 1, and cites Padmanaban et al. for its disclosure of the acid generators TPSCNC-1, TPSCNC-2 and TPSCNC-4 which are allegedly equivalent to the acid generator of formula (b-2) recited in claim 1. The Examiner contends that it would have been obvious to use TPSCNC-4 as acid generator (b) in the composition of Nishimura et al. with a reasonable expectation of success.

Although Applicants do not agree with the rejection, claim 1 as amended no longer recites formula (b-2). The only acid generator now recited in claim 1 is formula (b-1) which is neither disclosed nor suggested by either of the cited references. Accordingly, claims 1-3 and 6-8 cannot be obvious over these references because nothing in these references would suggest the claimed invention including this claim element.

Uetani et al. (US 2001/0014428) in view of Hatakeyama et al. (US 2002/0207201)

Claims 1-8 were rejected under 35 U.S.C. 35 U.S.C. §103(a) as being unpatentable over Uetani et al. (US 2001/0014428) in view of Hatakeyama et al. (US 2002/0207201). The Examiner acknowledged that Uetani et al. do not include sulfonium compounds (b-1) and (b-2) as recited in present claim 1, but cited Hatakeyama et al. for its disclosure of acid generators PAG-1 and PAG 5-8 which are allegedly equivalent to the acid generator of formula (b-2) of the instant application. The Examiner contends that it would have been obvious to use the acid generators of Hatakeyama in the chemically amplified positive resist composition of Uetani et al. with a reasonable expectation of success.

Although Applicants do not agree with the rejection, claim 1 as amended no longer recites formula (b-2). The only acid generator recited in claim 1 is formula (b-1) which is neither disclosed nor suggested by either of the cited references. Accordingly, claims 1-8 cannot be even *prima facie* obvious because this claim element is missing from both of the cited references.

Kodama et al. (US 2005/0095532) in view of Padmanaban et al. (*Proceedings of SPIE*, 5039:743-751, 2003)

Claims 1 and 3-8 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kodama et al. (US 2005/0095532) in view of Padmanaban et al. (*Proceedings of SPIE*, 5039:743-751, 2003). The Examiner acknowledged that Kodama et al. do not give specific examples of formula (V) giving bis(alkylsulfonyl)imide anions in which the alkyl group is substituted with fluorine atom, and cites Padmanaban et al. for its disclosure of the acid generators TPSCNC-1, TPSCNC-2 and TPSCNC-4 which are allegedly equivalent to the acid generator of formula (b-2) recited in claim 1. The Examiner contends that it would have been obvious to use TPSCNC-4 in the composition of Kodama et al. with a reasonable expectation of success.

Although Applicants do not agree with the rejection, claim 1 has been amended such that it longer recites formula (b-2). The only acid generator recited in claim 1 is formula (b-1), which is neither disclosed nor suggested by either of the cited references. Accordingly, claims 1 and 3-8 cannot be even *prima facie* obvious because nothing in the cited prior art would suggest the inclusion of this missing element.

Unexpected Results

Even had the cited references established a *prima facie* showing of obviousness with respect to the presently pending claims, the presently claimed invention provides unexpected results, which further evidence the nonobviousness of the claims. Both the resist composition, and method for forming resist patterns using such resist compositions recited in the present claims have unexpected advantages that could not have been predicted based upon any of the cited references, either alone or in combination. In particular, the claimed resist compositions exhibit an unexpectedly high level of resolution, minimal line edge roughness (LER), and a broad depth of focus. Nothing in any of the cited references would lead one of ordinary skill in the art to expect these significant unexpected results, since none of these recognize the excellent effects of the present invention. Accordingly, the results achieved with the presently claimed invention are unexpected results that could not have been predicted based on any of the cited references, either alone or in combination. These unexpected results would effectively rebut any finding of *prima facie* obviousness.

Under the state of the art prior to the present invention, the anion portions (acid portions) of the onium salts used as acid generators are almost all chain-like fluorinated alkylsulfonate ions containing a large number of carbon atoms which allow favorable control of the diffusion length of the acid within the resist film. However, the safety of these fluorinated alkylsulfonic acids is a concern, and the use of such compounds is now being restricted on a worldwide basis (see present specification at page 2, lines 11-21) The use of sulfonium compound (b-1) as an acid generator, as recited in present Claim 1, provides a short diffusion length within the resist film which allows one to avoid using the long-chain fluorinated alkylsulfonic acids described above (present specification, page 3 paragraph 4). However, if this sulfonium compound (b-1) were simply combined with conventional ArF resins, the fine levels of resolution, LER and depth of focus requirements would still be problematic. The Applicants have unexpectedly discovered

that the combination of the recited specific resin and acid generator as claimed results in improvement of these characteristics.

By using a combination of a resin with a weight average molecular weight of no more than 8,000 containing the structural units (a), and the sulfonium compound represented by formula (b-1) as the acid generator, an adequate transparency for use within a resist used in a process that employs a wavelength of 200 nm or less (such as an ArF excimer laser) is obtained. Furthermore, a resist pattern can be formed that exhibits excellent resolution and pattern shape as well as reduced levels of LER and defects. In addition, the depth of focus (DOF) during formation of the resist pattern is large, and the shape of the obtained resist pattern is favorable (present specification, page 7, paragraph 13). These effects are illustrated in Examples 1 to 8 and Comparative Examples 1 to 4 of the present application. Namely, when the weight average molecular weight of the resin of the component (A) is no more than 8,000 (Example 1, 3 and 4: Mw = 6200; Example 2: Mw = 7500; Example 6: Mw = 6400; Example 7 and 8: Mw = 7200), each depth of focus (DOF) is large, 450 to 500 nm.

In contrast, when the weight average molecular weight of the resin of the component (A) is more than 8000 (Comparative example 1: Mw = 9500; Comparative example 2: Mw = 9800; Comparative example 3: Mw = 10500; Comparative example 4: Mw = 9000), each depth of focus (DOF) is small, 200 to 350 nm. In addition, the former dramatically improves LER (7.5-11.0 nm). The latter does not improve LER (15.0-19.5 nm). In the level of developing defects, the former shows 0.04 to 0.7 defects/ cm^2, and defects are dramatically reduced. The latter shows 50 to 3050 defects/ cm^2, and defects are not improved (present specification, Table 1 and Table 2).

Thus, the data in the specification show that the claimed combination produces unexpectedly superior properties over the comparative examples. These unexpected properties further evidence the nonobviousness of the presently claimed invention. Accordingly, the rejections under 35 USC 103(a) should be withdrawn both because no *prima facie* showing of obviousness can be set forth on the basis of the cited references, and because the unexpected results would rebut any such showing even if present.

New Claims

New Claim 9 recites that component (A) is a resin with a weight average molecular weight of no more than 7,500, containing structural units (a1), (a2) and (a3), and that component (B) includes a sulfonium compound represented by a general formula (b-1) or (b-2). When the resin having the above features is combined with a sulfonium compound represented by a general formula (b-1) or (b-2), a high level of resolution can be achieved. Namely, in the component (A), the structural units (a) preferably also include structural units (a2), in addition to the structural units (a1). Inclusion of the structural units (a2) improves the resolution (present specification at page 12, paragraph 24). In addition, the structural units (a) preferably also include structural units (a3), in addition to the structural units (a1) and the structural units (a2). Inclusion of the structural units (a3) contributes to an improvement in the resolution (present specification at page 15, paragraph 0030). The present application discloses that the most preferred configurations are components containing the structural units (a1) through (a3) (present specification at page 19, lines 12 to 13).

Thus, the resist composition recited in new claim 9 results in improved fine levels of resolution, together with LER and depth of focus requirements which cannot be achieved by combine these sulfonium compounds and conventional ArF resins. Neither Nishimura et al. nor Padmanaban et al. disclose or suggest these features. Thus, even if the resin of Nishimura et al. and the acid generators of Padmanaban et al. are combined, the resist composition of claim 9 would not be obtained.

The resin described by Uetani et al. contains dihydroxy-1-adamantyl (meth) acrylate. In contrast, the resin recited in present claim 9 contains the structural units (a3) derived from a (meth) acrylate ester containing a hydroxyl group-containing aliphatic hydrocarbon group. In addition, the number of hydroxyl groups of the structural units (a3) recited in Claim 9 differs from Uetani et al. which does not necessarily contain structural units (a1), (a2) and (a3). Thus, the resin of Uetani is not the same as that recited in Claim 9. Neither Uetani et al. nor Hatakeyama et al. disclose or suggest these features. Thus, even if the resin of Uetani et al. and the acid generators of Hatakeyama et al. are combined, the resist composition of claim 9 would not be obtained. These results could not have been predicted based on the disclosure of these references, either alone or in combination.

In Kodama et al., the weight average molecular weight of resin is from 1,000 to 200,000. In contrast, present Claim 9 recites a resin with a weight average molecular weight of no more

than 7,500 which contains structural units (a1), (a2) and (a3) which is neither disclosed nor suggested by Kodama et al. Thus, even if the resin of Kodama et al. and the acid generators of Padmanaban et al. are combined, the resist composition of claim 9 would not be obtained.

New claim 13 recites that component (B) includes a sulfonium compound represented by a general formula (b-1) or (b-2), and also comprises an onium salt-based acid generator containing a straight-chain fluorinated alkylsulfonate ion of 1 to 7 carbon atoms as an anion. Furthermore, the blend ratio (weight ratio) between the onium salt-based acid generator and the one or more compounds selected from the sulfonium compounds is within a range from 1:9 to 9:1 (present specification at page 28, lines 14-16). In addition, a weight average molecular weight of a resin which is combined with the above acid generators is no more than 7,500.

The present application discloses that the pattern shape and the LER are unexpectedly superior by mixing the acid generators together in this type of ratio (present specification at page 46, line 7 to page 47, line 2). These results could not have been predicted based on the disclosure of any of the cited references, either alone or in combination, since none of these references disclose or suggest mixing the sulfonium compound represented by the formula (b-1) or (b-2), and an onium salt in this ratio.

CONCLUSION

Applicants submit that all claims are in condition for allowance. Should there be any questions concerning this application, the Examiner is respectfully invited to contact the undersigned at the telephone number appearing below.

Respectfully submitted,

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Dated: 1/14/08

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